

Central America Reconstruction Project

Implementation Plan

For

Honduras

October 1, 1999 – December 31, 2001

August 2000

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
U.S. National Weather Service

I. Introduction

Background

The 1998 hurricane named Mitch spread death and destruction across Honduras. More than 5,000 people were killed and total economic losses are estimated to exceed \$4 billion. Much of the basic infrastructure was damaged or destroyed. This implementation plan is part of the Department of Commerce's effort to help Honduras rebuild their economies and improve their abilities to respond to and mitigate against hurricanes and other natural disasters.

Purpose of this Plan

This plan discusses the National Oceanic and Atmospheric Administration, National Weather Service (NOAA/NWS) Hurricane Reconstruction Program for Honduras. The plan addresses the problems and issues, the objectives, coordination of activities, and the applicability to other plans of this project. Much of this plan is taken from the framework provided by the Department of Commerce's (DoC) implementation plan for reconstruction work in Central America, last updated July 1999. The management and implementation approaches, and schedule will be discussed in general with a more detailed implementation forthcoming. This plan supersedes the December 1999 implementation plan provided to USAID for the first phase of the project.

The NWS program in Honduras is consistent with the USAID/Honduras Plan for Natural Resources and Hazard Mitigation Information Generated and Applied (NAREHAMIGA), Results Package 2.3 of SO2. These activities specifically address RP 2.3.1 Data Centers and User Network Established and Utilized and RP 2.3.3 Hydrologic Data Generated and Made Available.

Period of Project

This plan describes the NOAA/NWS activities in Honduras for the full length of this project, which is through 31 December 2001. Discussions are provided for both activities that are underway and expected to be completed by 30 September 2000 (as discussed in the December 1999 NOAA/NWS plan) and for proposed activities that will be started after 30 September 2000 and completed by 31 December 2001.

II. Statement of Problems and Issues

Hurricane Mitch caused destruction that uncovered a number of problem areas that must be addressed in order for Honduras to recover from the current devastation and to better prepare for lessening the losses from future natural disasters. The problem areas that this plan will address can be grouped into 3 areas: (1) Base Infrastructure; (2) Forecast and Early Warning Systems; and (3) Disaster Preparedness and

Response. Many of the problem areas addressed in this plan are recommendations of the WMO report on Modernization of National Hydrological and Meteorological Services Affected by Hurricane Mitch.

Base Infrastructure

Hurricane Mitch destroyed much of the infrastructure in Honduras. Reconstruction and recovery depends to a large extent on the restoration and development of the following base infrastructure:

Hydrometeorological Data Collection Networks

Much of the pre-Hurricane Mitch hydrometeorological monitoring network in Honduras was either destroyed or is in a state of disrepair. One half of the Synoptic stations, 74 percent of the weather stations, and 80 percent of the telemetry stations were damaged or destroyed. A strategic network of automatically reporting meteorological stations and stream flow gauges along with a reliable telecommunications system is essential for forecasting and early warnings of severe weather and other natural events. This will provide the backbone for improvements to the countries forecasting and warning capabilities.

Satellite Receiving Station

Available information indicates that regional satellite receiving stations were damaged or destroyed. These type stations are critical for detection and monitoring of storms and to support meteorological forecasts, flood forecasts, and other applications.

Forecast and Early Warning Systems

Before Hurricane Mitch existing forecast and warning systems in Honduras were in need of substantial repairs and modernization. After Mitch caused extensive damage to the systems, the ability to prepare and disseminate forecasts and warnings became severely impaired. Reconstruction of the systems and preparation for future extreme climatic events requires that the systems be upgraded and, where necessary, replaced using sustainable technology appropriate for this region.

Forecast systems

Satellite data receiving capabilities in the region that are essential to accurate forecasting in Honduras, were damaged or destroyed and must be replaced. Evaluations of conditions before and after Hurricane Mitch indicate a critical need for improved forecast systems for storm events, flooding, and other natural hazards.

Early Warning Systems

Assessments of the impacts of Hurricane Mitch indicate the need for establishment of effective forecast and emergency warning systems to alert disaster management personnel, the public, and the media of extreme weather conditions and flooding. Hazards include tropical storms, heavy precipitation, floods, mudslides, droughts, and fires. During Hurricane Mitch, use of a manual local flood warning program (developed and implemented by the Organization of American States, OAS) in northern Honduras was very successful in saving lives and minimizing economic losses. In flash flood prone areas such as the mountains in Honduras, where a community is vulnerable to floods that can occur within a few hours from the rainfall event then a more automated approach is necessary.

Disaster Preparedness and Response

To protect life and property in future severe natural events, it is imperative that Honduras rebuild and, where appropriate transform the existing infrastructure to allow for better preparation for and management of natural disasters.

Strengthening Forecasting, Warning, Preparedness, and Response Institutions

Best available information indicated a shortage of trained and experienced personnel at the National Meteorological Service (SMN), the Permanent Commission for Emergencies (COPECO), and in other environmental agencies. There is a need to educate personnel in these agencies in basic hydrometeorological data collection and forecasting skills, as well as the methodologies and implications of regional climate forecasting, including the use of appropriately scaled regional models.

For establishment of a successful monitoring, forecasting, and response system, all critical elements of a chain must function properly if impact of climate extremes, hurricane, floods, droughts, or mudslides to vulnerable communities is to be minimized.

Forecast, Warning, and Emergency Response

Honduras prepared for and responded to Hurricane Mitch with available resources and an admirable effort, however it was apparent that storm and flood warnings were hampered by a lack of information to identify the nature and severity of hazards as well as the organizational structure to coordinate among municipal, national, and regional agencies and organizations. NOAA/NWS Hurricane forecasts were limited because of a very poor data input into the hurricane forecast models. Warnings were limited to rainfall forecasts since no operational hydrologic forecast capability had been developed. Although SERNA has the legal responsibility to warn its citizens of impending floods, it does not have access to reliable data nor does the organization have the tools or training to predict floods.

III. Project Objectives

Consistent with the Department of Commerce's Implementation Plan For Reconstruction Work in Central America the NWS proposes to assist post-Mitch reconstruction in Honduras by helping to: (1) rebuild and improve the base infrastructure components of the Hydrometeorological Data Collection Network; (2) build and improve forecast and early warning systems for storm events, flooding, and other natural hazards; (3) strengthen disaster preparedness and response.

The level of effort for each activity, i.e. number of hydrometeorological monitoring stations installed, is contingent on actual costs to implement, changes in counterpart agency requirements, and unforeseen problems. The number of monitoring sites may be increased or decreased.

The following sections list the activities to be accomplished for each of the three problem areas identified above. Activities are separated into Phase I (i.e., those activities to be completed by 30 September 2000) and Phase II (i.e., those activities to be completed by 31 December 2001).

These activities are based on knowledge of existing systems, counterpart priorities and requirements, other donor activities and other NOAA in-country and regional activities.

I. Rebuild and Improve the Base Infrastructure

1.1 Hydrometeorological Data Collection Network

This objective provides an opportunity to improve the weather and flood forecasting capabilities by replacing and upgrading existing damaged sites and expanding the pre-hurricane networks of weather observation and river gauge sites. It should be noted that NOAA/NWS originally planned to assist SMN with the upgrade and/or expansion of the synoptic monitoring network by providing automatic weather stations. However, based on other similar, donor activities this effort was reduced.

Phase I (completed by 30 September 2000)

- *Install five automatic precipitation gages in the Río Choluteca basin*

NOAA/NWS will install five automatic precipitation stations in the Río Choluteca basin to support river and flood hydrologic forecast systems. Gages will be installed at El Zurzular, Ocote Bonito, San Lucas, Nueva Armenia, and Las Mesas de Colón.

- *Support the refurbishment of a satellite data receive ground station and relocation of the station to SMN*

The existing satellite data receive ground station at ENEE will be relocated to the airport in Tegucigalpa under the responsibility of SMN. The data transmitted from automatic hydrologic and meteorological instruments to the GOES satellite will be able to be received through this ground station. The station has been inoperable since Mitch. NOAA/NWS will work with the Honduran counterparts to recondition and relocate this station and then connect it to the wide area network (WAN) that will be established (see Forecast and Early Warning Systems).

Phase II (completed by 31 December 2001)

- *Install one automatic weather station on Swann Island, off the Honduran coast*

The Honduran surface meteorological observation network encountered major damage during MITCH. The French government through loans and the French company Sofreavia is rebuilding 13 key automatic weather stations. NOAA/NWS proposes to replace the damaged site on Swan Island with an automatic weather observation station. This installation will greatly improve the ability of SMN and other meteorological services in the region to predict the movement and severity of tropical storms.

- *Install one automatic precipitation gage in the Río Choluteca basin*

Due to issues regarding gage siting and permission for installation, installation of the Santa Lucia station is delayed until Phase II.

- *Install an upper air monitoring system*

Observing the upper atmosphere is a very important element in predicting future weather conditions. One of the reasons for the poor hurricane model prediction performance during the Mitch episode was the total lack of upper air information in Central America. Measurement of the upper atmospheric conditions is primarily accomplished by periodic launching of radiosonde weather balloons. This upper air data was not available during Mitch. NOAA/NWS will install a GPS-based system for SMHN in Tegucigalpa and provide sufficient expendables for 100 launches and spares for one year. Operation training will be provided during installation.

2. Improve Forecast and Early Warning Systems

Phase I (completed by 30 September 2000)

- *Link SMN, SERNA and COPECO with a communications network*

A reliable Wide Area Network (WAN) will be established that will link SMN, SERNA, and COPECO in order to more rapidly furnish critical information to those who need it. This will strengthen forecasting, warning, preparedness, and response agencies. PCs will be installed at each of the critical agencies and a high speed WAN will provide the mechanism for all data, forecasts, warnings and products to be available for these agencies 24 hours a day, 7 days a week.

- *Provide a flash flood forecast and early warning system for Tegucigalpa and the upper Río Choluteca basin*

A flash flood forecast and early warning system will be installed for the upper Río Choluteca. The system, which will be installed at SERNA, will be used to provide immediate warnings for Tegucigalpa during potential flash flood situations. The system will incorporate the automatic precipitation gages installed by NOAA/NWS and selected streamgages installed by the U.S. Geological Survey (USGS). The system will provide automated early warning capability to local authorities based on preset alarm conditions such as precipitation rate and amounts, river stage, and rate of change of river stage. The system will also provide SERNA the capability to make hydrologic forecasts for this portion of the Río Choluteca. Outputs will be made available on the WAN.

Phase II (completed by 31 December 2001)

- *Install the National Weather Service River Forecast System (NWSRFS) for the Río Choluteca basin*

The NWSRFS is used by each of the 13 River Forecast Centers in the United States to provide river and flood forecasts on major rivers throughout the country. The NWSRFS will be installed and calibrated for the entire Río Choluteca basin. Outputs include assessments of current hydrologic conditions and streamflow forecasts; these can be used for short-term flood forecasting and daily streamflow forecasting. Forecasts can be then used for operations such as water supply, irrigation withdrawals and reservoir management. The system can also be used for long-term (months, seasons) flood outlooks, water supply forecasts, and drought analysis. While the flood forecast system installed for the upper Río Choluteca is designed for the specific flood characteristics of that portion of the basin, namely flash floods with time to crest occurring in only a few hours, the NWSRFS is designed for longer lead-time floods –

with time to crest of greater than six hours. The two systems then complement each other by providing tools to forecast and manage the conditions throughout the basin.

NWSRFS provides maximum lead warning time and forecast accuracy for flood warnings. Since the Río Choluteca basin is an important region in Honduras in terms of population at risk to flooding and mudslides and since a growing population and economy is dependent on water supply from the river, the application of the forecasting system will have many flood mitigation and water management benefits in Honduras. The process to implement the forecast system is as follows:

Steps to Implement NWSRFS

Purchase 2-3 Scientific Workstation computers

Purchase 2-3 PCs

Conduct Data Inventory

Process/Quality control data

Initialize Forecast System to the Basin

Calibrate Hydrologic Models

Link Real Time data sources to NWSRFS Data Processor

Train SERNA Hydrologists

Link WAN to NWSRFS Work Station

Certify Operational System

The forecast system (located in a HP Scientific workstation computer) will be established within SERNA with output available at SMN and COPECO and to other agencies that want to establish a node on the WAN. All forecast hydrologic data and forecast information will be available to the cooperating agencies by the high speed WAN.

The NWSRFS will be implemented in two phases. The initial implementation will provide an operational and functional system using hydrologic models calibrated with historical data. The final implementation will use available real-time data to adjust the calibrations.

As with the flash flood forecast system for the upper Río Choluteca basin, the NWSRFS will incorporate the automatic precipitation gages installed by NOAA/NWS and selected streamgages installed by the U.S. Geological Survey (USGS).

- Provide a flood forecast and early warning system for the Río Aguan*

A flood forecast and early warning system similar to that installed for the upper Río Choluteca will be installed for the Río Aguan. The area of the Río Aguan to be included in the system has not yet been identified and the design has not been finalized but will be based on future discussions with the counterpart agencies. Though the system will be similar in design, it is anticipated that it will involve the application of fewer NOAA/NWS-installed precipitation gages. NOAA/NWS will install the precipitation gages and will incorporate USGS-installed streamgages. The NWS will coordinate the design and implementation of any additional river gages needed for flood forecasting with the USGS.

- *Provide flood inundation mapping for Tegucigalpa*

The models in the NWSRFS will be used to provide real-time maps of potential flood inundation areas from the Río Choluteca as it traverses through Tegucigalpa. These maps, which also incorporate high-resolution digital elevation model (DEM) data, can be used by emergency management personnel to determine potential flood areas during an event. This capability will be incorporated as part of the NWSRFS system and will be provided to SERNA.

- *Develop National Strategic Implementation Plan*

NOAA/NWS will assist SMN with development of short (2-5 years) and long-range (5-10 years) plans for strengthening the agency, developing budget strategies and sustaining the new technologies. This plan will include development of equipment maintenance budgets.

4. Strengthen Disaster Preparedness and Response

Activities for this problem area focus on training and capacity building. Training is an important aspect of all the activities planned. To sustain the improved technical abilities long after this project is completed, extensive training of key personnel that are committed to the concept of quality public service is imperative. All training will be conducted in Spanish and all documentation, i.e. training materials, users guides, will be provided in Spanish.

Training will be (1) at workshops, both in country and elsewhere, (2) NWS training courses when available, (3) special training courses developed especially for Central America, and (4) on the job training working side-by-side with experts. Training will incorporate personnel from SERNA, SMN and COPECO except where noted.

Training will be provided on the operation and maintenance of all installed systems. Some specific training activities are highlighted below.

Phase I (completed by 30 September 2000)

- *A workshop to introduce participants to River Forecast Systems was held in October 1999. Two persons from Honduras attended. Note that funding for attendance at this workshop will be from the NOAA regional supplemental program budget, not from the NOAA Honduras program budget.*
- *Two people, one each from SMN and SERNA, were sent to a 15-month operational hydrologist and meteorologist postgraduate program at the University of Costa Rica, to provide Honduras with more trained operational hydrometeorologists. The program started in June 2000.*
- *Training in the operation and maintenance of automatic precipitation gauges.*
- *Operation training for PC base station hardware and software for automatic precipitation stations and the upper Río Choluteca basin flash flood forecast and warning system.*
- *Training on hydrologic forecasting techniques using the flash flood forecast and warning system for the upper Río Choluteca basin.*
- *Operation training for the Wide Area Network.*

Phase II (completed by 31 December 2001)

- *Workshop on hydrologic forecasting for meteorological and hydrological counterpart agencies from all affected countries (NOAA/World Meteorological Organization sponsored). One SERNA person and one SMN person will be sponsored. Note that funding for attendance at this workshop will be from the NOAA regional supplemental program budget, not from the NOAA Honduras program budget.*
- *Training in the use and maintenance of the hardware and software for operating automatic weather observation stations.*

- *Training in the use of new forecast products (NWSRFS and flash flood forecast systems).*
- *Training will be provided for key personnel of SMN, COPECO, SERNA, and other environmental agencies in basic hydrometeorological data collection and forecasting skills (NWSRFS and flash flood forecast systems).*
- *SERNA hydrologists will be trained in the operation of NWSRFS and the flash flood forecasting system for forecasting river flows, floods, and droughts.*
- *Training will be provided to appropriate SMN, COPECO, SERNA, and ENEE personnel in an overview of operation and maintenance of river forecast systems and automated flood-warning systems.*
- *Training will be provided to appropriate personnel in emergency planning and in the preparing of public hazard warnings.*
- *Training in the operations of a forecast center. Note that funding for attendance at this workshop will be from the NOAA regional supplemental program budget, not from the NOAA Honduras program budget.*

I. Coordination of Activities

NWS will make every effort to ensure that its activities are coordinated with those of other donor programs, USAID's field missions, and other U.S. agencies. NWS will continue to participate in conference calls with all involved U.S. agencies. All interested Honduran agencies and NGOs are being asked to share their views of this plan. Close coordination is being maintained with the US Geological Survey in locating field sites and sharing hardware and data. NWS will participate in monthly planning and coordination meetings being held in Honduras and including USGS, USACE, NWS, SMN, COPECO, SERNA, ENEE, and others.

V. Applicability To Other Plans

This plan is compatible with Honduras reconstruction needs described in the USAID, World Meteorological Organization, and Department of Commerce plans and will be coordinated with USGS, USDA, USACE, FEMA, and other appropriate agencies.

VI. Prioritization

Priority will be given to items that can be most rapidly implemented to provide assistance to protect people and property. Examples are: (1) flash flood warning systems, and (2) improved communications between the agencies responsible for obtaining hydrometeorological information and warning the public.

VII. Management Plan

Within NOAA there will be a Program Manager who will report to and work directly with the DOC Program Manager. The NOAA Program Manager will be responsible for closely monitoring all administrative and budgetary requirements of the agency's activities, including the reporting and other requirements of DoC's Interagency Agreement with USAID. In addition, the NOAA Program Manager will be responsible for timely providing to the DOC Program Manager country and regional work plans and information regarding NOAA's activities for inclusion in DoC's quarterly progress report to USAID, as required by the Interagency Agreement.

Within NWS there will be a Program Manager who will coordinate all NWS Central America reconstruction activities and will be responsible for providing to the NOAA Program Manager timely reports of NWS activities for inclusion in quarterly progress reports to USAID. In addition there will be a NWS Country Manager for each of the countries of El Salvador, Guatemala, Honduras, and Nicaragua. The Country Manager for Honduras is Terry Lamb, a Civil Engineer and Hydrologist with many years of project planning and management experience. These Country Managers will be responsible for planning, scheduling, and oversight of NWS Reconstruction Projects in their respective assigned countries. In addition they will coordinate projects with USAID, OFDA, in country agencies, and NGOs. They will work closely with the NWS Program Manager to furnish all needed information for quarterly progress reports.

VIII. Sustainability Issues

This project will provide electronic and mechanical instruments to be installed in the field, electronics and computers for several offices, training for operating and maintenance of the instruments, and training in hydrometeorological forecasting. These things will help provide climate and stream hazard-warning services. This, however, is only a 2-year project. Steps need to be taken by the Honduran Government Agencies involved to plan for the support of these services after this project is complete. As part of this project documents will be produced detailing the resources, including materials, tools, personnel, and budget support necessary to maintain the equipment and services provided after the project end date of December 31, 2001. The documents will detail for each agency such items as the cost of: (1) training necessary to maintain the skills to operate various systems, (2) the inventory of parts needed to keep the systems operating, (3) and the number of people necessary and the skills needed to operate the systems that will be installed as part of this project. In addition, the need for future expansions and the estimated costs to install and operate the recommended systems will be discussed.

After successful installation and checkout, all hardware and software will be formally turned over to the Government of Honduras with stipulations as required by the USAID Mission. Once the equipment and software becomes the property of the GOH all maintenance will be the GOH's responsibility unless otherwise stipulated.

IX. Schedule

An implementation schedule for the entire program for key activities is provided in the following table. Schedule priority has been given to those activities most crucial to protecting lives and property, most notably installation of flood early warning systems and components. The installation schedule for the Río Aguan flood early warning system is contingent on the installation schedule of streamflow gages by the U.S. Geological Survey.

<i>Program Schedule</i>	
<i>Installation, Operational or Implementation Date</i>	<i>Activity</i>
<i>By 30 September 2000</i>	<p><i>5 – Automatic precipitation stations to support flood forecasting for the Río Choluteca basin (El Zurzular, Ocote Bonito, San Lucas, Nueva Armenia, Las Mesas de Colón)</i></p> <p><i>Support the refurbishment of a satellite data receive ground station and relocation of the station to SMN</i></p> <p><i>Link SMN, SERNA, and COPECO with a communications network</i></p> <p><i>Implementation of a flash flood forecast and early warning system for Tegucigalpa and the upper Río Choluteca basin</i></p> <p><i>Sponsor Honduran counterparts at a workshop for the National Weather Service River Forecast System</i></p> <p><i>Sponsor Honduran counterparts at postgraduate training for operational meteorologists and hydrologists (training began in June 2000 and will run for 15 months)</i></p> <p><i>Training for operation and maintenance of automatic precipitation gages</i></p> <p><i>Operation training for PC base station hardware and software for automatic precipitation stations and the upper Río Choluteca basin flash flood forecast and warning system.</i></p> <p><i>Training on hydrologic forecasting techniques using the flash flood forecast and warning system for the upper Río Choluteca basin.</i></p> <p><i>Operation training for the Wide Area Network</i></p>
<i>By 31 December 2000</i>	<i>1 – Automatic precipitation station to support</i>

<i>Program Schedule</i>	
<i>Installation, Operational or Implementation Date</i>	<i>Activity</i>
	<p><i>flood forecasting for the Río Choluteca basin (Santa Lucia)</i></p> <p><i>1 – Automatic Weather Station (Swann Island)</i></p> <p><i>Development of national strategic implementation plan</i></p> <p><i>Workshop on hydrologic forecasting for meteorological and hydrological counterpart agencies (NOAA/World Meteorological Organization sponsored)</i></p> <p><i>Training in the use of hardware and software for operating automatic weather stations</i></p>
<i>By 31 March 2001</i>	<p><i>1 – Upper air monitoring system</i></p> <p><i>Installation of required automatic precipitation gages in the Río Aguan basin to support the flood forecast and early warning system</i></p> <p><i>Training in the operations of a forecast center.</i></p>
<i>By 30 June 2001</i>	<p><i>Initial implementation of the NWSRFS for the Río Choluteca basin</i></p> <p><i>Implementation of a flood forecast and early warning system for the Río Aguan basin</i></p> <p><i>Training will be provided for key personnel of SMN, COPECO, SERNA, and other environmental agencies in basic hydrometeorological data collection and forecasting skills (NWSRFS and flash flood forecast systems).</i></p> <p><i>SERNA hydrologists will be trained in the operation of NWSRFS and the flash flood forecasting system for forecasting river flows, floods, and droughts.</i></p>
<i>By 30 June 2001</i>	<p><i>Training will be provided to appropriate</i></p>

<i>Program Schedule</i>	
<i>Installation, Operational or Implementation Date</i>	<i>Activity</i>
	<i>SMN, COPECO, SERNA, and ENEE personnel in an overview of operation and maintenance of river forecast systems and automated flood-warning systems</i>
<i>By 30 September 2001</i>	<i>Final implementation of the NWSRFS for the Río Choluteca basin (additional calibration adjustments)</i> <i>Provide real-time flood inundation mapping capabilities for Tegucigalpa</i> <i>Training will be provided to appropriate personnel in emergency planning and in the preparing of public hazard warnings using NWSRFS and flood forecast systems</i>
<i>By 31 December 2001</i>	<i>Emergency maintenance on NWS-installed systems</i> <i>Complete maintenance and operation training for all NWS-systems</i>

X. Budget

The NWS budget for the first and second phases of the El Salvador program follows the budget outlined in the Interagency Agreement (IAA) between the Department of Commerce and USAID. Detailed activity budgets will be developed in conjunction with selected contractors to ensure adherence to the IAA trached budgets. The budget breakdown is shown in the following table.

Program Budget					
Problem Area	Activities	Description	Problem Area Budget Through 30 September 2000	Problem Area Budget 1 October 2000 – 31 December 2001	Total Problem Area Budget
<i>Base Infrastructure Reconstruction</i>	<i>Reconstruct and Improve Hydro-meteorological Data Collection Network</i>	<i>6 – Automatic precipitation stations</i> <i>Support of satellite data receive ground station</i> <i>1 – Automatic weather station on Swann Island</i> <i>1- Upper air monitoring station with spares and expendables</i> <i>Emergency maintenance on equipment</i>	\$290,000	\$195,000	\$485,000
<i>Forecast and Early Warning Systems</i>	<i>Implementation of community-based flood warning system</i>	<i>Flash flood forecast and warning system for Tegucigalpa and the upper Río Choluteca basin</i>	\$730,000	\$885,000	\$1,615,000
<i>Forecast and Early</i>	<i>Implementation of</i>				

Program Budget					
Problem Area	Activities	Description	Problem Area Budget Through 30 September 2000	Problem Area Budget 1 October 2000 – 31 December 2001	Total Problem Area Budget
<i>Warning Systems (con't)</i>	<i>community-based flood warning system</i>	<i>Flood forecast and warning system for the Río Aguan (includes associated field monitoring equipment)</i>			
	<i>Implementation of river and flood forecast system</i>	<i>Real-time flood inundation mapping capability for Tegucigalpa</i>			
	<i>Implementation of communications system</i>	<i>National Weather Service River Forecast System for the Río Choluteca</i>			
	<i>National Strategic Implementation Plan</i>	<i>Link SMN, SERNA, and COPECO with a Wide Area Network</i>			
	<i>Development of strategic plans</i>				
<i>Forecast and Early Warning Systems</i>	<i>Training and Capacity Building</i>				

Program Budget					
Problem Area	Activities	Description	Problem Area Budget Through 30 September 2000	Problem Area Budget 1 October 2000 – 31 December 2001	Total Problem Area Budget
(con't)		<i>Post graduate training in Costa Rica for 2 students</i> <i>Training for operation and maintenance of precipitation gages and automatic weather stations</i> <i>Training for Wide Area Network operations</i> <i>NWSRFS training</i>			
<i>Disaster Preparedness and Response</i>	<i>Training and Capacity Building</i>	<i>Workshop on hydrologic forecasting (NOAA/WMO)</i> <i>Operation training for PC base station for precipitation gages and flood forecasting systems</i>	\$45,000	\$50,000	\$95,000
<i>Disaster</i>	<i>Training and</i>	<i>Training on</i>			

<i>Program Budget</i>					
<i>Problem Area</i>	<i>Activities</i>	<i>Description</i>	<i>Problem Area Budget Through 30 September 2000</i>	<i>Problem Area Budget 1 October 2000 – 31 December 2001</i>	<i>Total Problem Area Budget</i>
<i>Preparedness and Response (con't)</i>	<i>Capacity Building</i>	<i>hydrologic forecasting techniques</i> <i>Training on hydro-meteorological data collection and forecasting (NWSRFS and flash flood systems)</i> <i>Training on emergency planning and public warnings using NWSRFS and flood forecast systems</i>			

XI. Counterpart Assistance

The following table summarizes the GOH counterpart agencies for various activities

Summary of Assistance By Agency

Assist with identification of users and user products	COPECO, SERNA, SMN
Assist with image building	COPECO, SERNA, SMN
Assist with public sector financial support	COPECO, SERNA, SMN
Improve Hydrometeorological Data Collection	
Weather Monitoring Systems	SMN
Precipitation Only Stations	SMN, SERNA
Install Hardware to Support Data Collection	SMN, SERNA
Instrumentation Siting and Installation	SMN, SERNA
Install Upper Atmosphere Monitoring Station	SMN
Access to Regional Products	SMN
Improve Forecast and Early Warning Systems	
Install Communications Hardware and Software	COPECO, SERNA, SMN
Install and Calibrate Floodwatch for Upper Rio Choluteca	SERNA, SMN
Install and Calibrate a NWSRFS for Rio Choluteca	SERNA
Install Hardware for Rio Choluteca NWSRFS	SERNA, SMN
Install and Calibrate Floodwatch for Rio Aguan	SERNA
Install Hardware for Rio Aguan Warning Systems	SMN, SERNA
Install Hardware for Upper Rio Choluteca Floodwatch	SERNA, SMN
Strengthen Disaster Preparedness and Response	
Develop a Plan for Reliable High-Speed Communications	COPECO, SERNA, SMN
Develop a Plan for More Effective Emergency Warnings	COPECO
Training and Capacity Building	
Operation of Hazard Warning Systems including NWSRFS	COPECO, SERNA, SMN
Basic Hydrometeorological and Forecasting Skills	SMN, SERNA
Operation of Observation and Communication Systems	COPECO, SERNA, SMN
Regional Climate Forecasting	SMN
Emergency Planning Workshop	COPECO, SERNA, SMN